REMARKS

Claims 1 and 3-58 are pending in this application. Claims 20-56 are presently withdrawn.

By this Amendment, claims 1 and 20 are amended to delete reference to a network structure and to add that the carbon nanotube structure is formed by (1) functional groups of the carbon nanotubes bonded to each other by the cross-linked sites comprised of a hydrocarbon having 2 to 10 carbon atoms or (2) functional groups of the carbon nanotubes bonded to each other directly as the cross-linked sites. These amendments overcome the rejection of the claims under 35 U.S.C. §112, second paragraph as will be further discussed below, and are supported in the original specification at, for example, page 61, line 18 to page 62, line 3 and page 65, lines 13-16 (describing the connecting group formed by reaction between the functional groups and the cross-linking agent being comprised of a hydrocarbon having from 2 to 10 carbon atoms), and at, for example, page 48, line 17 to page 52 (describing the carbon nanotube structure wherein the functional groups are directly bonded to each other without the use of any cross-linking agent). Accordingly, no new matter is added by these amendments.

In addition, claims 5, 6, 8-10, 15 and 29 are amended for antecedent basis purposes and/or to correct typographical errors, and claims 22 and 23 are amended to be consistent with claims 5 and 6. Claims 57 and 58 are added to further define the hydrocarbon of the cross-linked sites as comprising 2 to 5 carbon atoms and 2 to 3 carbon atoms, respectively, again as supported in the original specification at page 65, lines 13-16.

Applicants appreciate the courtesies shown to Applicants' representative by Examiners Miller and Hendriks in the August 21, 2008 interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks.

In view of the foregoing amendments and the following remarks, reconsideration of this application is respectfully requested.

I. Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 1 and 3-19 were rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite.

With respect to the objection to the term "network structure" in claim 1, claim 1 has been amended as discussed above to replace this term with a definition of the carbon nanotube structure. Accordingly, this rejection is moot.

With respect to the objection to the term "carrier" in claim 1, page 7 of the present specification makes it clear that a carrier is a hole or electron that is transmitted via a conduction path in the transporting layer, and must be construed accordingly. The term "carrier" in the present claims is thus clear and definite in accordance with the requirements of 35 U.S.C. §112, second paragraph.

For the foregoing reasons, withdrawal of this rejection is respectfully requested.

II. Rejections Under 35 U.S.C. §103(a)

Three separate rejections of claims 1 and 3-19 under 35 U.S.C. §103(a) were set forth in the Office Action. Each of the three rejections relies upon U.S. Patent No. 7,282,742 (Tsukamoto) as the primary reference. These three rejections are: (1) Tsukamoto in view of U.S. Patent No. 6,426,134 (Lavin), (2) Tsukamoto in view of the Appl. Phys. Lett. article entitled "High Power Electrochemical Capacitors Based on Carbon Nanotube Electrodes" (Niu), and (3) Tsukamoto in view of U.S. Patent No. 7,250,147 (Tour). Each of these rejections is respectfully traversed.

Claim 1 is directed to an electronic device comprising three or more electrodes in a transporting layer. The transporting layer comprises a carbon nanotube structure comprising a plurality of carbon nanotubes and cross-linked sites on the carbon nanotubes. The carbon

nanotube structure is one of two structures, each defined in claim 1 and described separately in the present specification. The first structure comprises the carbon nanotube structure being formed by functional groups of the carbon nanotubes bonded to each other by the cross-linked sites, the cross-linked sites being comprised of a hydrocarbon having 2 to 10 carbon atoms. See, for example, page 43, line 1 to page 48, line 16 of the specification. In the second structure, the carbon nanotube structure is formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-linked sites, i.e., without the use of a cross-linking agent. See, for example, page 48, line 17 to page 53, line 11 of the specification. The three or more electrodes comprise at least a source electrode, a drain electrode and a gate electrode to constitute a field effect transistor structure.

Tsukamoto alone, or Tsukamoto in combination with any of Lavin, Niu or Tour, would not have directed one of ordinary skill in the art to have derived the electronic device defined in present claim 1.

Tsukamoto would have directed one of ordinary skill in the art away from the electronic device of present claim 1, and the combination of Tsukamoto with any of Lavin, Niu and Tour would not have been made by one of ordinary skill in the art because the combination as alleged by the Patent Office would have destroyed the semiconductor element of Tsukamoto, as clearly explained in Tsukamoto.

Tsukamoto describes an organic semiconductor material in which carbon nanotubes are dispersed in a conjugated polymer, with the weight fraction of the carbon nanotubes being 3% or less relative to the conjugated polymer. See the Abstract. As shown in Figure 1 of Tsukamoto, the semiconductor element includes a silicone wafer 50/gate electrode 60, a silicone dioxide film (dielectric layer) 40 thereon, source electrodes 30 and drain electrodes 20 on the silicone dioxide film 40, and an organic semiconductor layer 10 including the carbon nanotubes on and around the source and drain electrodes.

In order to function as a semiconductor layer, Tsukamoto specifically describes that the carbon nanotube amount in the layer must be limited to 3 weight % or less. The reason for this is explained throughout Tsukamoto as follows:

"In the present invention, since a very small amount of CNTs [carbon nanotubes] are blended, almost no conductive path is formed by the CNTs being contacted with each other." (column 3, lines 28-30).

"Since it is not intended to improve the electrical conductivity through the use of the conductive paths formed by the CNTs being contacted with each other, the amount of dispersion of CNTs must be controlled at a low level." (column 3, lines 40-44).

"However, if more than 3% of CNTs are blended, a proportion of CNTs in contact with each other is increased and, thereby, the electrical conductivity of the CNT-polymer composite is sharply increased and becomes close to that in a metal state. Consequently, the composite cannot be used as a semiconductor." (column 7, lines 14-19).

From the foregoing descriptions in Tsukamoto, it is clear that Tsukamoto requires the carbon nanotube/polymer blend to include no more than 3 weight % of carbon nanotubes so that the carbon nanotubes can be dispersed in the polymer without substantially contacting each other. In this way, conductive paths are not formed in the carbon nanotube/polymer layer, enabling the layer to properly function as a semiconductor as desired and required in Tsukamoto. As such, Tsukamoto clearly requires the carbon nanotubes to <u>not</u> be in contact with each other to any substantial degree so as to minimize the formation of conductive paths in the layer, thereby enabling the layer to function as a semiconductor layer.

In the Office Action, it was alleged that one of ordinary skill in the art would have found it obvious to have replaced the semiconductor layer of Tsukamoto with a layer including a cross-linked structure of carbon nanotubes as allegedly taught in Lavin, Niu and Tour. However, if one were to have included a structure in which the carbon nanotubes are

cross-linked with each other in Tsukamoto, the resulting structure would have an extremely high number of conductive paths due to the contact between the carbon nanotubes as a result of the cross-linking. As clearly explained in Tsukamoto, this would result in a layer not being able to function as a semiconductor as required of layer 10 in Tsukamoto.

Tsukamoto thus clearly teaches one of ordinary skill in the art away from the use of cross-linked nanotube structures in semiconductor layer 10, and thus would have led one of ordinary skill in the art away from the present claims and away from the alleged combination of Tsukamoto with Lavin, Niu and Tour.

Moreover, one of ordinary skill in the art clearly would not have made the alleged combination of Tsukamoto with Lavin, Niu or Tour because one of ordinary skill in the art would have recognized that the combination would destroy the function and purpose of the semiconductor element described in Tsukamoto. That is, as was clearly explained in Tsukamoto, contact between the carbon nanotubes in the semiconductor layer 10 of Tsukamoto must be minimized in order for the layer to function as a semiconductor layer as required. One of ordinary skill in the art would have recognized that including cross-linked nanotube structures in the layer 10 of Tsukamoto would have destroyed the semiconductor function of this layer. Accordingly, one of ordinary skill in the art would not have made any of the alleged combinations set forth in the Office Action.

In addition, Applicants respectfully submit that none of Lavin, Niu or Tour would have directed one of ordinary skill in the art to the electronic device of claim 1 wherein the electronic device included a transporting layer having a carbon nanotube structure formed by functional groups of the carbon nanotubes bonded to each other by cross-linked sites comprised of a hydrocarbon having 2 to 10 carbon atoms, or formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-linked sites.

Lavin merely describes single-wall carbon nanotube-polymer composites in which the carbon nanotubes have at least one end chemically bonded to a polymer. However, in Example 1 of Lavin, both dodecanedioic acid (DDDA) and hexamethylene diamine (HMD) are used, which exceed 10 carbon atoms. Lavin nowhere describes a carbon nanotube structure as a transporting layer of an electronic device as recited in claim 1, wherein the carbon nanotube structure is formed by functional groups of the carbon nanotubes bonded to each other by cross-linked sites comprised of a hydrocarbon having 2 to 10 carbon atoms.

Niu describes carbon nanotube sheet electrodes for use as high power electrochemical capacitors. Niu describes that carbon nanotubes may be modified by introducing oxygenate groups onto the surface thereof, and then the capacitor may be formed by dispersing the carbon nanotubes in water, filtering to yield a carbon nanotube sheet, and then drying and thermally cross-linking to form a rigid carbon nanotube electrode. See the right hand column of page 1480. Niu nowhere describes utilizing the high power electrical capacitors as described therein as a transporting layer in an electronic device that also includes three or more electrodes including at least a source electrode, a drain electrode and a gate electrode to constitute a field effect transistor as recited in claim 1.

Tour describes a process for chemically modifying carbon nanotubes to include a diazonium species. See the Abstract. Figures 18 and 19 of Tour indicate that the modified carbon nanotubes may be cross-linked. However, nowhere does Tour describe that the composites set forth therein may be utilized as a transporting layer in an electronic device including three or more electrodes, wherein the three or more electrodes include at least a source electrode, a drain electrode and a gate electrode as required in present claim 1.

For the foregoing reasons, none of Lavin, Niu or Tour would have directed one of ordinary skill in the art to have employed any of the carbon nanotube structures described therein in an electronic device such as recited in present claim 1. Accordingly, nothing in

Lavin, Niu or Tour would have directed one of ordinary skill in the art to have utilized the carbon nanotube composites described therein in the structure of Tsukamoto, contrary to the teachings of Tsukamoto as detailed above, with any reasonable expectation of success.

For all the foregoing reasons, Applicants respectfully submit that Tsukamoto, Lavin, Niu and Tour, alone or in combination, would not have directed one of ordinary skill in the art to the electronic device of claim 1 or claims dependent therefrom. Withdrawal of each of the rejections under 35 U.S.C. §103(a) is thus respectfully requested.

III. Rejoinder

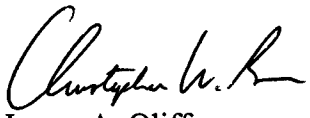
Claims 20-56 are presently withdrawn from consideration. However, pursuant to MPEP §821.04, because the withdrawn claims include all of the features of claim 1, Applicants respectfully request that upon allowance of the elected claims, claims 20-56 should be rejoined and similarly allowed.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1 and 3-58 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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